CLAIMS

1. A plasma generator, comprising:

a) a vacuum chamber;

b) a stage located within the vacuum chamber, on which a base plate is to be placed; and

c) multiple radiofrequency (RF) antennas arranged substantially parallel to the stage within the vacuum chamber.

2. The plasma generator according to claim 1, wherein the antennas are attached to one or both of a sidewall and a ceiling wall of the vacuum chamber.

3. The plasma generator according to claim 1 or 2, wherein each antenna includes a conductor whose length is shorter than a quarter wavelength of an RF power supplied to the antenna.

4. The plasma generator according to one of claims 1 to 3, comprising a plate-like conductor connected to the multiple antennas in parallel.

5. The plasma generator according to claim 4, a distance between a connection point at which the power source supplying the power to the antennas is connected to the plate-shaped conductor and each connection point at which each antenna is connected to the plate-shaped conductor is made shorter than the quarter wavelength of the RF wave.

6. The plasma generator according to one of claims 3 to 5, wherein a sum of the length of the conductor of the antenna and the distance between the aforementioned

connection points is smaller than the quarter wavelength of the RF power.

7. The plasma generator according to one of claims 1 to 6, comprising:

a phase detector for detecting a phase of the RF power supplied to each of the groups; and

a phase matcher for regulating the phase of the RF power.

8. The plasma generator according to one of claims 1 to 7, wherein an aspect ratio of the antenna at a position corresponding to a target area of the stage is set at a value determined according to a plasma density or plasma electron energy desired for the target area.

9. The plasma generator according to claim 8, wherein the aspect ratio of the antenna corresponding to the target area is larger than that of the other antenna so as to increase the plasma density or electron density at the target area.

10. The plasma generator according to claim 9, wherein the area includes a center of the stage.

11. The plasma generator according to one of claims 1 to 10, wherein electrodes of the antennas are arranged roughly parallel to the stage and adjacent electrodes of one or more pairs of adjacent antennas have the same polarity.

12. The plasma generator according to claim 11, wherein the adjacent electrodes of every pair of the adjacent antennas have the same polarity.

13. The plasma generator according to one of claims 1 to 12, wherein an impedance element is connected to the antennas.

14. The plasma generator according to claim 13, wherein multiple antennas are connected to one RF power source in parallel.

15. The plasma generator according to claim 13, wherein one antenna is connected to one RF power source.

16. The plasma generator according to one of claims 13 to 15, wherein the impedance element has a variable impedance value.

17. The plasma generator according to claim 16, wherein the impedance element is a variable inductance coil.

18. The plasma generator according to claim 16 or 17, comprising a measurement unit for measuring a voltage or current of each antenna and a controller for setting the variable impedance value on the basis of the voltage or current measured with the measurement unit.

19. The plasma generator according to claim 18, wherein the measurement unit includes a pick-up coil that is located in proximity to an antenna and detects a current of the antenna.

20. The plasma generator according to claim 18 or 19, wherein the measurement unit includes a capacitor that is located in proximity to an antenna and detects a voltage applied to the antenna.

21. The plasma generator according to one of claims 18 to 20, wherein the measurement unit includes a bridge circuit or a wave detector for converting a detected signal of RF current or voltage into a direct current or voltage.

22. The plasma generator according to one of claims 18 to 20, wherein the measurement unit includes a mixer for mixing a current signal and a voltage signal of the antenna and a low-pass filter for removing a RF component from the mixed signal.

23. The plasma generator according to one of claims 1 to 22, wherein a surface of the antennas is coated with an insulator.

24. The plasma generator according to one of claims 1 to 23, wherein the shape of the antennas within the vacuum chamber is flat.

25. The plasma generator according to one of claims 1 to 24, wherein each of the multiple antennas are divided into groups each including one or more antennas, and a RF power is supplied to each antenna in parallel within each group.

26. A plasma control method using a plasma generator having multiple RF antennas located within a vacuum chamber, said antennas being arranged on one or both of a sidewall and a ceiling wall of the vacuum chamber and roughly parallel to a stage on which a

base plate is to be placed, wherein a state of plasma generated within the vacuum chamber is controlled by regulating a RF power supplied to each antenna.

27. The plasma control method according to claim 26, wherein the state of plasma is controlled by regulating lengths of the antennas within the vacuum chamber.

28. The plasma control method according to claim 26 or 27, wherein the state of plasma is controlled by regulating a phase difference of the RF power supplied to the antennas.

29. The plasma control method according to one of claims 26 to 28, wherein an aspect ratio of an antenna located at a position corresponding to a target range of the stage is determined according to a plasma density or plasma electron energy desired for the target area, or according to ion species or radical species to be generated in the target area.

30. The plasma control method according to claim 29, wherein the aspect ration of a RF antenna corresponding to the target area is set to a larger value than that of the other antennas so as to increase the plasma density or electron energy at the target area.

31. The plasma control method according to claim 30, wherein the target area includes the center of the stage.

32. The plasma control method according to one of claims 26 to 31, wherein a plasma density distribution within the plasma generator is controlled by giving an equal polarity to adjacent electrodes of one or more pairs of adjacent antennas.

33. The plasma control method according to claim 32, wherein the adjacent electrodes of every pair of the adjacent antennas have the same polarity.

34. The plasma control method according to one of claims 26 to 33, wherein an impedance element is connected to each of the antennas, and a plasma density distribution within the vacuum chamber is controlled by regulating an impedance value of each impedance element.

35. The plasma control method according to claim 34, wherein the impedance value of the impedance element is variable, one or both of a voltage and current of each RF antenna are measured, and the variable impedance value is controlled according to the voltage, the current or a product of the voltage and the current measured.

36. A method of producing a substrate, wherein plasma of a material is generated by a plasma generator according to one of claims 1 to 25 or a plasma control method according to one of claims 26 to 35, and the material is deposited.

37. A method of producing a substrate, wherein an etching process is carried out using plasma generated by a plasma generator according to one of claims 1 to 25 or a plasma control method according to one of claims 26 to 35.